

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. _____

WASTE DISCHARGE REQUIREMENTS
FOR
HOWARD ESTATE AND UNIMIN CORPORATION
UNIMIN CORPORATION IONE PLANT
TAILINGS IMPOUNDMENTS
AMADOR COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

1. Unimin Corporation operates and the Howard Estate owns (hereafter jointly Discharger) a silica sand mining operation near Ione. The facility was previously regulated by Waste Discharge Requirements (WDRs) Order No. 5-01-169.
2. In a Regional Water Board letter, dated 4 January 2005, the Discharger was informed that, based on groundwater monitoring data, the mine waste may be incorrectly classified as a Group C mining waste and therefore the letter requested a revised Report of Waste Discharge. The Discharger submitted a Report of Waste Discharge and a Comprehensive Hydrogeology Investigation on 26 January 2007. Following discussions with Regional Water Board staff, the Discharger proposed to dewater and discharge future tailings as a paste like material containing 55 to 65% solids. Pilot testing indicates that after placement dewatered tailings will consolidate 33% and will have a final hydraulic conductivity of 10^{-7} cm-sec. These revisions to the tailings management procedures will protect water quality by eliminating most free draining leachate and leaving a dense, low permeability waste. These WDRs incorporate the Discharger's proposed revisions to the tailings management procedures.
3. The Discharger's Ione Plant is about two miles south of Ione on State Highway 124. The facility is in Sections 35 and 36, T6N, R9E, and Sections 1 and 2, T5N, R9E, MDB&M, as shown on Attachment A, which is incorporated herein and made a part of this order. The facility is on Assessor's Parcel Numbers 05-130-012, -033, -034 and -035, 05-150-004 and -006, 05-160-003, -004, -009, -010, -011, -012, -013, -014 and -015, and 05-190-004.
4. The Discharger extracts silica sand and white clay from the Ione Formation by open pit mining. The mining operation produces two grades of fine to medium grained silica sand, an unoxidized pyrite and lignite bearing sand and an oxidized iron oxide and iron carbonate sand. The sand is used by the glass industry. White clay is currently discharged as part of the tailings, in the future some white clay may be sold

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as product. The mine has been in continuous operation since 1955. Unimin has operated the facility since July 2000.

5. The facility uses previously mined, unlined excavations as tailings ponds and a storm water retention pond. Currently tailings are discharged as slurry to Ponds I and K. Storm water is contained in Ponds J and J-1 and the Mill Pond holds process makeup water. Water from the tailings ponds and from the stormwater ponds are pumped to the Mill Pond for reuse as process water.
6. Currently, Ponds I and K are active tailings ponds; former Ponds F and G were reclaimed in 2007; and former Pond H/I is being reclaimed in the 2008 construction year. The ponds are shown on Attachment B, which is incorporated herein and made a part of this order.
7. Currently, mining is taking place in the South Pit. Approximately 60 to 125 feet of overburden is stripped off to expose the sand layer. Overburden is stockpiled for use in pond embankments, reclamation activities and mine pit backfill. The sand is mined to a laterite layer that developed on the greenstone bedrock.
8. Mined out pits are backfilled with clay and silt rejects, float rejects, wet screen rejects and overburden fill. The mining rate is dependent on mining yield, annual sales demand and plant capacity. Mining is done with a dozer-slurry transport mining system.
9. Excavated clay-sand ore is mixed with water to produce slurry for processing. The slurry is passed through a series of screens to remove oversize material. Then some of the clay is removed. Sand is extracted from the slurry with a double flotation process. The first flotation removes aluminum silicates and refractory heavy minerals; the second flotation removes the desirable quartz sand from undesirable iron minerals. The quartz sand is drained and a filter aid, Calsuds 81, may be added to reduce the surface tension of the water. The sand is dried in a gas-fired dryer and further processed by dry screening and magnetic separation.

10. The Discharger may add the following chemical products for ore processing:

Chemical	Est. Concentration at 12.6 mgd discharge
Hydrochloric Acid (HCL)	4.2 mg/l
Tallow diamine	3.9 mg/l
Tall-Oil Fatty Acid	50.4 mg/l
Sodium dodecylbenzene sulfonate, ethylene oxide and non ionic detergent blend	2.9 mg/l
Sodium Hydroxide (NaOH)	Variable
Lime	Variable
Magnesium hydroxide	Variable
Calcium carbonate	Variable
Anionic flocculent (proposed)	Variable
Cationic flocculent (proposed)	Variable

11. Currently, the facility discharges about 2,200 tons per day of solid wastes and about 12.6 million gallons per day (mgd) of process water to the tailings ponds. Much of the water is re-circulated through the plant in a closed loop process.

12. The Discharger proposes to dewater the tailings prior to discharge to the tailings pond, removing most of the water and eliminating the need for settling ponds. The dewatered tailings will contain approximately 60% solids and will be discharged at one of two discharge points. Tailings discharge points will be switched every two weeks to allow the tailings to consolidate between successive depositional events. Pilot plant testing determined that dewatered tailings consolidate by 33% in two weeks with an approximate hydraulic conductivity of 10^{-7} cm/sec.

13. The Discharger currently discharges tailings to Ponds I and J with an estimated capacity of 2,342 acre-feet. When the dewatering process becomes operational the Discharger will operate a single smaller tailings pond. After dewatering, the return water will be discharged to the Mill Pond for reuse. Freshwater, supplied by Amador Water Agency, is added to the Mill Pond to replace water lost to processing and evaporation.

14. The Discharger submitted a water balance that indicated the pond system has the capacity to hold precipitation for the average annual rainfall.
15. Ione Minerals, an adjacent facility, may withdraw up to 1,000 gpm from the Mill Pond for clay processing.

WASTE CLASSIFICATION

16. The facility waste stream consists of solid tailings waste mixed with water discharged to unlined impoundments. The following summarizes water quality data from testing of the tailing solids, water in the tailings pond, process water from the Mill Pond and groundwater from upgradient monitoring wells.

Table 1. Waste Classification Data

Constituent	Tailings Solids ⁽¹⁾	Tailings Pond ⁽²⁾	Mill Pond ⁽³⁾	Background Groundwater ⁽⁴⁾	Water Quality Goals ⁽⁵⁾
pH (units)	4.4	4.5	5.6	5.8	6.5 – 8.5
Aluminum (ppb)	1,080	145,000	na	9,200	600
Iron (ppb)	5,540	188,000	na	38,200	5,000
Lead (ppb)	na	580	na	42	15
Nickel (ppb)	113	180	na	25	100
Sodium (ppb)	6,180	122,000	200,000	60,500	20,000
Sulfate (ppb)	55,500	486,000	500,000	172,000	500,000

⁽¹⁾ Leachable concentrations from tailings solids extracted using the USGS Field Leach test protocol (roughly equivalent to the California DI WET test).

⁽²⁾ Average concentrations from water in the tailings pond, collected between 2002-04.

⁽³⁾ Concentrations from a single sampling event of process water in the Mill Pond.

⁽⁴⁾ Average concentrations in groundwater collected from upgradient monitor wells between 2002-04.

⁽⁵⁾ From Marshack, "A Compilation of Water Quality Goals".

17. Leachable concentrations from tailings solids exceed water quality goals for aluminum, iron, nickel, and sodium. The pH is below the water quality goal. The leachate exceeds background groundwater concentrations for nickel.

18. The water in the tailings ponds exceeds water quality goals and background groundwater concentrations for aluminum, iron, lead, nickel, and sodium. Tailings pond pH is below the water quality goal.
19. Title 27 of the California Code of Regulations (CCR) Section 22480 states in part the following: "...**Group B** — mining waste of Group B are: "...mining wastes that consist of or contain nonhazardous soluble pollutants of concentrations which exceed water quality objectives for, or could cause, degradation of waters of the state..." Therefore the tailings solids and leachate are classified Group B mining waste.
20. Therefore, the former and active tailings ponds are Group B Mining Waste Management Units.

SITE DESCRIPTION

21. The measured hydraulic conductivity of the native soils underlying the site ranges between 1.4×10^{-6} and 8.1×10^{-6} cm/sec.
22. Land uses within 1,000 feet of the facility are ranching and mining.
23. There are seven domestic, industrial, or agricultural groundwater supply wells within one mile of the site.
24. The facility receives an average annual precipitation of 22 inches and an average annual pan evaporation of 59.88 inches as measured at the Camp Pardee Station (weather station #041428).
25. The 100-year, 24-hour precipitation event is estimated to be 4.32 inches, based on Department of Water Resources' Engineering Meteorology website Rainfall Depth-Duration-Frequency Table for Ione, updated to include data through 2000.
26. The facility is not within a 100-year flood plain based on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map.

SURFACE AND GROUND WATER CONDITIONS

27. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basin, Fourth Edition (hereafter Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin.

28. Surface drainage is toward Dry Creek in the Sutter Creek Hydrologic Area (531.11) of the San Joaquin River Basin. Dry Creek drains to the Mokelumne River, which drains to the San Joaquin River.
29. The designated beneficial uses of the Mokelumne River - Camanche Reservoir to Delta, as specified in the Basin Plan, are irrigation, stock watering, contact and non-contact water recreation, warm and cold freshwater habitat, warm and cold migration, warm and cold spawning, and wildlife habitat.
30. The first encountered groundwater is about 41 to 54 feet below the native ground surface. Groundwater elevations range from 190 to 350 feet MSL. The groundwater is unconfined. The depth to groundwater fluctuates seasonally as much as 4 feet.
31. Monitoring data indicates background groundwater quality has total dissolved solids (TDS) concentrations ranging between 217 and 440 mg/l with a mean of 296 mg/l.
32. The direction of groundwater flow is toward the south south-west. The average groundwater gradient is about 0.0344 feet per foot. The average groundwater velocity is 1.1 feet per year.
33. The designated beneficial uses of the groundwater, as specified in the Basin Plan, are domestic and municipal, agricultural, and industrial supply.

GROUNDWATER AND IMPOUNDMENT MONITORING

34. The groundwater detection monitoring system consists of two background wells (MW-J and -N) and twelve downgradient wells (MW- A, -B, -D, -E, -F, -G, -H, -I, -K, -L, -M, AND -O).
35. The impoundment monitoring system consists of those ponds currently containing process water
36. The Discharger's detection monitoring programs for groundwater and surface water satisfy the requirements contained in Title 27.

GROUNDWATER DEGRADATION

37. Groundwater immediately downgradient of the Mill Pond (process water), Ponds G and F (tailings), and Pond J (stormwater) contains concentrations of TDS, sulfate, chloride, sodium, aluminum and Iron greater than background. The following Table is a summary of groundwater impacts associated with current or former ponds:

Table 2. Groundwater Impacts

Constituent	MW-J ⁽¹⁾ (Background) (mg/l)	MW-E ⁽²⁾ (Mill) (mg/l)	MW-F ⁽³⁾ (Pond G) (mg/l)	MW-G ⁽⁴⁾ (Pond F) (mg/l)	MW-I ⁽⁶⁾ (Stormwater) (mg/l)
TDS	296	766	1,431	1,224	661
Sulfate	122	505	1,039	821	75
Chloride	25	58	32	33	223
Sodium	30	95	94	138	68.3
Aluminum	4.6	10	13	11.1	12
Iron	11	34	34	26	29

⁽¹⁾ MW-J is an upgradient well representative of background groundwater conditions.

⁽²⁾ MW-E is immediately downgradient of the Mill Pond.

⁽³⁾ MW-F is immediately downgradient of Pond G.

⁽⁴⁾ MW-G is immediately downgradient of Pond F.

⁽⁵⁾ MW-I is immediately downgradient of Pond J and J-1.

37. Groundwater immediately downgradient from process water pond, tailings ponds and stormwater pond is impacted with increased concentrations of TDS, sulfate, sodium and iron. Because of the low hydraulic conductivity of the lone formation groundwater impacts do not extend a great distance from the ponds.

38. Staff anticipates that the discharger's proposed changes to tailings handling protocol will prevent future groundwater impacts.

DESIGN OF WASTE MANAGEMENT UNITS

39. Title 27 §22480(c) states: "*Mining waste shall be treated or neutralized whenever feasible to minimize the threat to water quality and minimize the need to install waste containment structures.*" The Discharger proposes to treat their Group B Mine Waste tailings by dewatering the tailings and discharge a paste with approximately 60% solids. The tailings will be discharged into an unlined impoundment at alternating discharge points. The tailings will be deposited in thin layers to allow rapid loss of excess water and consolidation. Pilot tests indicate that dewatered tailings will consolidate by 33% in two weeks and have an approximate hydraulic

conductivity of 10^{-7} cm/sec. Clarified water from the dewatering process will be discharged to the Mill Pond for reuse.

40. Section 13360(a)(1) of the California Water Code allows the Regional Board to specify the design, type of construction, and/or particular manner in which compliance must be met in waste discharge requirements or orders for the discharge of waste at solid waste disposal facilities.
41. The Discharger proposes a treatment and disposal method to prevent migration of wastes from the Unit to adjacent natural geologic materials, groundwater, or surface water during disposal operations, closure, and the postclosure maintenance period in accordance with the criteria set forth in Title 27 for a Group B mining unit. Because the dewatered tailings will contain little free draining water and after consolidation the dewatered tailings will have a hydraulic conductivity equivalent to an engineered clay liner. Installation of a prescriptive liner would be an unnecessary expense and would not effectively protect water quality better than the Discharger's plan to treat the tailings by dewatering. The Discharger has demonstrated that the proposed treatment alternative is consistent with the performance goals of the containment structures for a Group B mining unit and affords equivalent protection against water quality impairment.

CEQA AND OTHER CONSIDERATIONS

42. The action to revise waste discharge requirements for this existing facility is exempt from the provisions of the California Environmental Quality Act (CEQA), Public Resource Code §21000, et seq., and the CEQA guidelines, in accordance with Title 14, CCR, §15301.
43. This order implements:
- a. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basin, Fourth Edition and
 - b. The prescriptive standards and performance goals of Title 27 of the California Code of Regulations, effective 18 July 1997, and subsequent revisions.
44. Section 13267 of the California Water Code states, in part, "(a) A regional board, in establishing...waste discharge requirements... may investigate the quality of any waters of the state within its region" and "(b) (1) In conducting an investigation..., the regional board may require that any person who has discharged, discharges, or is suspected of discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged,

discharges, or is suspected of discharging, or who proposes to discharge waste outside of its region that could affect the quality of waters of the state within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring these reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify evidence that supports requiring the person to provide the reports."

45. The technical reports required by this Order and the attached Monitoring and Reporting Program are necessary to assure compliance with these waste discharge requirements. The Discharger is responsible for the discharges of waste at the facility subject to this Order and is, therefore, subject to CWC Section 13267(b).

PROCEDURAL REQUIREMENTS

46. All local agencies with jurisdiction to regulate land use, solid waste disposal, air pollution, and to protect public health have approved the use of this site for the discharges of waste to land stated herein.
47. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge, and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.
48. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.
49. Any person adversely affected by this action of the Regional Water Board may petition the State Water Resources Control Board to review the action. The petition must be received by the State Water Resources Control Board within 30 days of the date of issuance of this Order. Copies of the law and regulations applicable to filing the petition will be provided on request.

IT IS HEREBY ORDERED pursuant to Sections 13263 and 13267 of the California Water Code, Order No. 5-01-169 is rescinded, and that the Howard Estate and Unimin Corporation, their agents, successors, and assigns, in order to meet the provisions of Division 7 of the California Water Code and the regulations adopted thereunder, shall comply with the following:

A. PROHIBITIONS

1. The discharge of 'hazardous waste' at this facility is prohibited. For the purposes of this Order, the terms 'hazardous waste' and 'designated waste' are as defined in Division 2 of Title 27 of the CCR.
2. The discharge of solid waste or liquid waste to surface waters, surface water drainage courses, or groundwater is prohibited.
3. The discharge of wastes outside of a tailings impoundment or portions of a waste management unit specifically designed for their containment is prohibited.
4. The discharge of any wastes other than mining wastes is prohibited.

B. DISCHARGE SPECIFICATIONS

General Specifications

1. Mine tailings shall only be discharged into, and shall be confined to tailings impoundments specifically designed for their containment.

Protection From Storm Events

2. Tailings impoundments shall be designed, constructed and operated to prevent inundation or washout due to flooding events with a 100-year return period.
3. Precipitation and drainage control systems shall be designed, constructed and maintained to accommodate the anticipated volume of precipitation and peak flows from surface runoff under 100-year, 24-hour precipitation conditions.
4. Annually, prior to the anticipated rainy season, any necessary erosion control measures shall be implemented, and any necessary construction, maintenance, or repairs of precipitation and drainage control facilities shall be completed to prevent erosion or flooding of the site.

Tailings Impoundments

5. The discharger shall discharge only dewatered tailings as described in Finding 12 to the unlined tailings impoundments. The tailings when discharged shall average 60% solids and after consolidation shall achieve an average hydraulic conductivity of 10^{-7} cm/sec or less.

6. The closure of each tailings impoundment shall be under the direct supervision of a California registered civil engineer or certified engineering geologist.
7. Tailings impoundments shall be closed and maintained in compliance with the approved reclamation plan.

C. RECEIVING WATER LIMITATIONS

Water Quality Protection Standards

The concentrations of Constituents of Concern in waters passing through the Points of Compliance shall not exceed the Concentration Limits established pursuant to Monitoring and Reporting Program No. R5-____-____, which is attached to and made part of this Order.

D. FINANCIAL ASSURANCE

1. The Discharger shall demonstrate financial responsibility for closure and post-closure maintenance, and shall submit a report of financial assurances by **April 30th each year** for Executive Officer review and approval. The assurances of financial responsibility shall provide that funds for closure and post-closure maintenance shall be available to the Regional Water Board upon the issuance of any order under California Water Code, Division 7, Chapter 5. The Discharger shall adjust the cost annually to account for inflation and any changes in facility design, construction, or operation.
2. The Discharger shall, by **30 April** of each year, submit for approval by the Executive Officer, plans with detailed cost estimates and a demonstration of assurances of financial responsibility to ensure closure and post-closure maintenance of each waste management unit in accordance with its approved closure and post-closure maintenance plans. The Discharger shall provide the assurances of financial responsibility to the Regional Water Board as required by Title 27 CCR, Division 2, Subdivision 1, Chapter 6. The assurances of financial responsibility shall provide that funds for corrective action shall be available to the Regional Water Board upon the issuance of any order under California Water Code, Division 7, Chapter 5. The Discharger shall adjust the cost annually to account for inflation and any changes in facility design, construction, or operation. The financial assurance fund for closure and post-closure maintenance shall be established within one month of the adoption of these WDRs.

E. PROVISIONS

1. The Discharger shall comply with the Standard Provisions and Reporting Requirements, dated September 2003, which are hereby incorporated into this Order. The Standard Provisions and Reporting Requirements contain important provisions and requirements with which the Discharger must comply. A violation of any of the Standard Provisions and Reporting Requirements is a violation of these waste discharge requirements.
2. The Discharger shall comply with Monitoring and Reporting Program No. - _____, which is attached to and made part of this Order. This compliance includes, but is not limited to, maintenance of waste containment facilities and precipitation and drainage controls and monitoring groundwater, the unsaturated zone, and surface waters throughout the active life of the waste management units and the post-closure maintenance period. A violation of Monitoring and Reporting Program No. _____ is a violation of these waste discharge requirements.
3. The Discharger shall provide proof to the Regional Water Board **within sixty days after completing final closure** that the deed to the tailings impoundment facility property, or some other instrument that is normally examined during title search, has been modified to include, in perpetuity, a notation to any potential purchaser of the property stating that:
 - a. The parcel has been used for disposal of wastes;
 - b. land use options for the parcel are restricted in accordance with the post-closure land uses set forth in the (reclamation plan) post-closure plan and in WDRs for the tailings impoundments; and
 - c. in the event that the Discharger defaults on carrying out either the post-closure maintenance plan or any corrective action needed to address a release, then the responsibility for carrying out such work falls to the property owner.
7. The Regional Water Board will review this Order periodically and may revise requirements when necessary.

F. REPORTING REQUIREMENTS

1. The Discharger shall comply with the reporting requirements specified in this Order, in Monitoring and Reporting Program Order No. _____ and in the Standard Provisions and Reporting Requirements dated September 2003.
2. By **1 July 2009**, the Discharger shall submit a Water Quality Protection Standard Report. The report shall incorporate all water quality data collected prior to June 2009 and shall propose water quality protection standards for each monitor point to detect evidence of future releases.
3. By **15 June 2010**, the Discharger shall revise their tailings waste handling procedures to discharge only dewatered tailings to unlined impoundments.
4. In the event of any change in ownership of this waste management facility, the Discharger shall notify the succeeding owner or operator in writing of the existence of this Order. A copy of that notification shall be sent to the Regional Board.

I, Pamela Creedon, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on _____.

PAMELA CREEDON, Executive Officer

Attachments